

CLAIMS

1. A magnetic head, comprising:
  - a magnetic yoke;
  - 5 a write gap layer formed between upper and lower poles of the magnetic yoke;
  - a write coil having a plurality of coil layers; and
  - each coil layer extending continuously between the upper and the lower poles through a plane defined by the write gap layer.
- 10 2. The magnetic head of claim 1, wherein the write coil has an electrical resistance sufficient to reduce thermal protrusion at an air bearing surface (ABS) of the magnetic head.
- 15 3. The magnetic head of claim 1, wherein the write coil has an electrical resistance that is less than 0.5 Ohms per coil turn.
4. The magnetic head of claim 1, wherein each coil layer has a height between the upper and the lower poles that is 4  $\mu\text{m}$  or greater.
- 20 5. The magnetic head of claim 1, wherein each coil separating layer is less than 0.4  $\mu\text{m}$ .

6. The magnetic head of claim 1, wherein the write coil further comprises a  
damascene-constructed write coil.

7. The magnetic head of claim 1, wherein each coil layer comprises copper  
5 and at least one of the upper and lower poles further comprises:  
a pole piece layer over/under which the write coil is positioned; and  
a pedestal formed over/under the pole piece layer at an air bearing surface (ABS).

8. The magnetic head of claim 1, wherein each coil layer comprises copper  
10 and at least one of the upper and lower poles further comprises:  
a pole piece layer over/under which the write coil is positioned;  
a pedestal formed over/under the pole piece layer at an air bearing surface (ABS);  
and  
the pole piece layer comprising alternating layers of magnetic and non-magnetic  
15 dielectric material.

9. A magnetic recording device, comprising:  
at least one rotatable magnetic disk;  
a spindle supporting the at least one rotatable magnetic disk;  
20 a disk drive motor for rotating the at least one rotatable magnetic disk;  
a magnetic head for writing data from the at least one rotatable magnetic disk;  
a slider for supporting the magnetic head;

the magnetic head including:

a magnetic yoke;

a write gap layer formed between upper and lower poles of the magnetic yoke;

5 a write coil having a plurality of coil layers; and

each coil layer extending continuously between the upper and the lower poles through a plane defined by the write gap layer.

10. The magnetic recording device of claim 9, wherein the write coil has an  
10 electrical resistance sufficient to reduce thermal protrusion at an air bearing surface  
(ABS) of the magnetic head.

11. The magnetic recording device of claim 9, wherein the write coil has an  
electrical resistance that is less than 0.5 Ohms per coil turn.

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12. The magnetic recording device of claim 9, wherein each coil layer has a  
height between the upper and the lower poles that is 4  $\mu\text{m}$  or greater.

13. The magnetic recording device of claim 9, wherein each coil separating  
20 layer is less than 0.4  $\mu\text{m}$ .

14. The magnetic recording device of claim 9, wherein the write coil further comprises a damascene-constructed write coil.

15. The magnetic recording device of claim 9, wherein at least one of the  
5 upper and lower poles further comprises:

a pole piece layer over/under which the write coil is positioned; and  
a pedestal formed over/under the pole piece layer at an air bearing surface (ABS).

16. The magnetic recording device of claim 9, wherein at least one of the  
10 upper and lower poles further comprises:

a pole piece layer over/under which the write coil is positioned;  
a pedestal formed over/under the pole piece layer at an air bearing surface (ABS);

and

the pole piece layer comprising alternating layers of magnetic and non-magnetic  
15 dielectric material.

17. A magnetic head, comprising:

a magnetic yoke;  
a write gap layer formed between upper and lower poles of the magnetic yoke;  
20 a write coil having a plurality of coil layers; and  
each coil layer extending continuously between the write gap layer and one of the  
lower pole and the upper pole of the magnetic yoke.

18. The magnetic head of claim 17, wherein no write coil portion is located between the write gap layer and the other one of the lower pole and the upper pole.

5        19. The magnetic head of claim 17, wherein the write coil has an electrical resistance sufficient to reduce thermal protrusion at an air bearing surface (ABS) of the magnetic head.

10      20. The magnetic head of claim 17, wherein the write coil has an electrical resistance that is less than 0.5 Ohms per coil turn.

21. The magnetic head of claim 17, wherein each coil layer has a height between the upper and the lower poles that is 4  $\mu\text{m}$  or greater.

15      22. The magnetic head of claim 17, wherein each coil separating layer is less than 0.4  $\mu\text{m}$ .

23. The magnetic head of claim 17, wherein the write coil further comprises a damascene-constructed write coil.

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24. The magnetic head of claim 17, wherein the one of the lower pole and the upper pole further comprises:

a pole piece layer under which the write coil is positioned; and  
a pedestal formed under the pole piece layer at an air bearing surface (ABS).

25. The magnetic head of claim 17, wherein at least one of the upper and  
5 lower poles further comprises:

a pole piece layer over/under which the write coil is positioned; and  
the pole piece layer comprising alternating layers of magnetic and non-magnetic  
dielectric material.

10 26. A magnetic recording device, comprising:

at least one rotatable magnetic disk;  
a spindle supporting the at least one rotatable magnetic disk;  
a disk drive motor for rotating the at least one rotatable magnetic disk;  
a magnetic head for writing data from the at least one rotatable magnetic disk;  
15 a slider for supporting the magnetic head;  
the magnetic head including:  
a magnetic yoke;  
a write gap layer formed between upper and lower poles of the magnetic  
yoke;  
20 a write coil having a plurality of coil layers; and  
each coil layer extending continuously between the write gap layer and  
one of the lower pole and the upper pole of the magnetic yoke.

27. The magnetic recording device of claim 26, wherein the write coil has an electrical resistance sufficient to reduce thermal protrusion at an air bearing surface (ABS) of the magnetic head.

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28. The magnetic recording device of claim 26, wherein the write coil has an electrical resistance of 4 Ohms or less.

29. The magnetic recording device of claim 26, wherein the write coil has an  
10 electrical resistance that is less than 0.5 Ohms per coil turn.

30. The magnetic recording device of claim 26, wherein each coil separating  
layer is less than 0.4  $\mu\text{m}$ .